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Get-together on Lamps, Lighting Fittings and Colour Glasses

This is the third in the series of get-togethers between research workers in the laboratories and those from industry organized in recent years by the National Physical Laboratory (NPL), New Delhi on 9 and 10 Dec. 1969. The first get-together on Thermometry was held in Feb. 1967 and this was followed by another on Weights and Balances in Dec. 1968. The present get-together was attended by about 180 delegates representing the lamp, lighting and glass manufacture and consumer establishments, small industries corporations of state governments, Indian Standards Institution and CSIR.

In his inaugural speech (read out) Prof. V. K. R. V. Rao, Union Minister of Education & Youth Services and Vice-President, CSIR observed that one of the most important problems facing CSIR is the 'credibility gap' between CSIR laboratories and Indian industries. Prof. Rao made the point that the scaling up of a research result into a commercial project is the task of the industry. A scientist can try a workable idea in his laboratory and then test its technical feasibility on a pilot plant. This is where his job ends. From here on the manufacturers should own the process, take the necessary risks and perfect the process for transforming it into a commercial enterprise. Welcoming the get-togethers of the type organized by NPL, he said that there should be a continuous dialogue between scientists, manufacturers and consumers to arrive at correct choice of problems for research. Such get-togethers stimulate scientists and technologists in their work at the bench. The interest of manufacturers and consumers in scientists and their work is one of the best rewards

scientists aspire for. The Vice-President made a reference to NPL's contributions to the growth of lamp and light fitting industries and to the improvement of the quality of the products of this important industry.

Dr Atma Ram, Director General, Scientific & Industrial Research, referred in a message to the tremendous progress the lamp and ancillary industries have made and stressed the need for testing and standardization work for maintaining the quality of products.

Problems concerned with the production, indigenous availability of raw materials and methods of standardization were the subjects of some twenty papers presented and discussed at the get-together. Of these, three papers were contributed by NPL, New Delhi and one each by CGCRI, Calcutta and CECRI, Karaikudi and the rest came from industry.

In his paper entitled 'Recent advances in light sources, photometry, colorimetry and radiometry' S. R. Das, NPL, New Delhi discussed the improved characteristics of recently developed sources of light which include general lighting service lamps, low voltage general purpose lamps, metal halide discharge lamps, phosphor light sources, etc. The present status of photometry and colorimetry was reviewed, and applied photometric and colorimetric techniques were discussed. Indication was given of the trend as to how light and colour quantities may in future be based on radiometry. Light emitting standards today define the units and quantities of light and colour; irradiation receivers with characteristic receptor properties may replace them in times to come.

Suggestions for improving the quality of automobile headlights to meet modern needs were given in the paper presented by K. S. Sarma of NPL.

The contributions of the Central Glass & Ceramic Research Institute, Calcutta to the production of coloured glasses and their testing formed the subject matter of the paper presented by S. N. Prasad and K.P. Srivastava of the institute. As special coloured glasses were not being produced in India, technical know-how for their production was developed by CGCRI. The special glasses covered are signal glasses, lenses and roundels, eye-protective glass filters, sun-goggle glass for the tropics, snow-goggle glass for snow-clad areas, and a special type of glass filter for absorbing light but transmitting infrared.

Presenting an analysis of the statistics regarding demand, present production and future requirements of tube light phosphors, R. Lakshminarayanan and coworkers of the Central Electrochemical Research Institute, Karaikudi made suggestions for animating the research and development activities in producing the phosphors and other allied accessories connected with the lamp industry.

'Testing of fluorescent luminaires' was another paper from NPL, in which V. D. Dandawate of the laboratory dealt with the problem of application of standard photometric procedure to fluorescent type of luminaires for achieving correct, unambiguous values. The latest definition of the CIE for the efficiency factor of fluorescent luminaire is explained and an apparatus constructed for this purpose described.

Delegates from industry put forward several items for discussion relating mostly to difficulties in procuring raw materials and quality control of raw materials. The discussions that took place during the two days led to the following tentative

recommendations. Follow-up action on the survey of lamp industry made by the Indian Institute of Foreign Trade in 1963 be taken up by the Ministries of Industrial Development & Company Affairs and Foreign Trade and also by the Indian Standards Institution. The present IS specification on autolamps needs revision to include environmental conditions. There is an acute shortage of raw materials for the lamp making industry, and imported supplies are not being tested due to lack of accurate standard test procedures. The Indian Standards Institution should look into this aspect. More free licensing of capital and testing

equipment be given to manufacturers for improving quality. NPL should take up assembly of package type testing equipment for supplying to manufacturers. The laboratory should organize training of personnel for quality control in industry; and should try to provide more testing facilities to include all tests—photometric, environmental, etc.—for lamps, lighting equipment, light measuring instruments as per IS specifications. Consumers, particularly those of automobile lighting equipment, should try to rationalize the type of autolamps and fittings. Consumers ought go in for only standard makes as certified by ISI.

Development of Lamp Industry : NPL's Role

by A. R. Verma, Director, NPL

During the last two decades the lamp, lighting fitting and colour glass industries have made phenomenal progress both in terms of production of some of the common consumer items and in the production of an ever-increasing variety of special items for specific needs. India is almost self-sufficient in respect of most of its requirements of lamps, lamp fittings and colour glasses. The country now manufactures over 91 million pieces of general light service lamps. Fluorescent tube production has risen to some 5 million pieces. The growth of the miniature lamp industry has also recorded a progressive rise and the present production is estimated at 30 million pieces. Besides the common lamps, India is manufacturing some sophisticated lamps, such as automobile lamps, miner's cap lamps, railway signal lamps, switchboard lamps, flash light lamps, lamps used on airstrips, etc.

Testing activities

The National Physical Laboratory has been in the mainstream of this development and has contributed in good measure to the rise of this industry. It undertook the testing of lamps, lamp fittings, colour glasses for railway and aviation signalling and neutral density filters for eye safety as and when they were manufactured. Standard specifications have been laid down by the Indian Standards Institution and

NPL has been undertaking the testing of various types of lamps in accordance with these specifications.

Photometric measurements

In photometric measurements the light output of a given lamp is compared with that of a standard lamp. The laboratory continuously maintains standard lamps as per specifications. In all measurements of light, the human eye is the ultimate judge of its quality though it is incapable of measuring the light quantitatively. Apart from this drawback, the characteristics of the eye vary widely in groups of observers and over a period of time. This has necessitated the replacement of visual comparison by the comparison using physical photometers. These photometers are fitted with photocells having a response of light similar to that of a postulated 'standard observer' or 'average eye' defined in terms of a standard response to light based upon the measurement of visual sensitivity curves of a large number of observers and approved by the International Commission on Illumination. One of the suitable photometers for measuring the light output of tungsten filament lamps from miniature size up to 2 kW comprises a photocell Osram KMV6, which has the characteristics of an average eye.

In addition to the measurement of the total light output, it is necessary to determine the distribution of

light intensity in different directions from the same lamp placed in its fittings. Because of its practical utility, demand for distribution photometry is quite high and the laboratory has been geared to undertake the measurement of the light intensity in different directions. This type of distribution photometry is essential when concentrated distribution is desired only in one or two directions as in some street lighting fittings and more significantly in airport taxiway signal fittings. In the latter, the range of variation in intensity within a very small angle is very high.

Life of general lamps

The other characteristics of the lamp are the luminous efficiency and its life. Commercial type general lighting service lamps of 60 W, which are normally used in household, have an average life of 1000 hr and an efficiency of 10-15 lumens per watt. These figures are derived on the basis of intermittent operations of continuous burning for 24 hr and cooling off for 1 hr approximately. Detailed analysis undertaken at the laboratory has shown that the life of an incandescent lamp varies inversely as the seventh power of efficiency. Rough service lamps from various Indian manufacturers were tested at NPL for the luminous efficiency and life. The results were analysed and it is essentially from the analysis of these results that IS specifications have been framed.

Distribution photometry

In addition to the testing of efficiency, total output, life of the lamps, it is important to test the general illumination. The importance of proper illumination in libraries, workshops, factories, auditoria, offices, streets, etc. is being increasingly realized. Proper illumination adds to the comfort of the workers, and hence increases output. The laboratory undertook a detailed investigation on the luminous efficiency and light distribution of a large number of industrial fluorescent tube light fittings. This has yielded valuable data which have been made available to architects and the lamp industry.

Colour characteristics

Industrial products have to be colour matched, colour graded and colour sampled. The need is therefore felt for a standard lamp of definite

spectral distribution. This lamp is to simulate daylight. A detailed investigation of the daylight studies in some of the principal towns in India over different seasons was undertaken by NPL. The study has yielded valuable information. Apart from the simulation of daylight it is necessary to colour grade some of the industrial products. Colour determines the quality and suitability of materials. Some time ago NPL studied the grading of sugar according to its whiteness and more recently at the instance of the Union Ministry of Food and Agriculture the laboratory gave its findings on the grading of different varieties of rice based on their colour characteristics. For paint, colour is the most obvious attribute. So also for textiles and woods. Coloured glasses used for signalling purposes for road and rail, aviation and navigation, must also have specified colours.

Properties of glasses

The laboratory also undertakes tests dealing with the transmission properties of various glasses. The transmission properties are extremely important when dealing with the goggles used either by an aircraft pilot or by an arc welder. These glasses should be such that they prevent heat and ultraviolet light from being transmitted. These aspects apart, a number of other jobs are undertaken like testing of TV screen brightness, calibration of light measuring metres, etc. on behalf of a number of institutions, defence establishments and Indian manufacturers.

In this context special mention should be made of the efforts of the Central Glass & Ceramic Research Institute (CGCRI), Calcutta which has helped in the development of signal glasses in the country. Normally the red colour in the red signal glass used in railways, aviation and navigation is obtained by incorporating selenium in the glass. Selenium being a scarce and imported constituent, CGCRI developed a different method of simulating the same colour.

In addition to the field of optics, NPL has been able to make significant contribution to the development of the industry by testing industrial products and also by developing the know-how for processes and products.



New laboratories at CDRI

New Laboratories for Medicinal Chemistry, Biochemistry and Biophysics at CDRI

At a function held at the Central Drug Research Institute (CDRI), Lucknow on 6 Jan. 1970 Dr A. R. Todd, Nobel Laureate, dedicated the new laboratories for medicinal chemistry, biochemistry and biophysics of the institute to 'the further advancement of science in relation to human welfare'.

Prof. Todd in his dedication address mentioned that pharmaceutical research or drug research has had a curious history. It developed from the chemical industry. Drug research really began in the dyestuff industry. Research in the matter of drugs concentrated within the growing chemical industry and it grew up there over a considerable period of years. The end result of this has been that in Europe and USA there are few, if any, institutes of the type of the Central Drug Research Institute of any significance. This is because drug research developed within the industry and directly so in association with medicine.

Speaking about the work of CDRI he said that there has been brilliant work done in the institute on fundamental aspects of medicinal chemistry and biology and it is also able to help the growing pharmaceutical

industry in the country. He said that, as outlined by Dr M. L. Dhar, the Director, the institute has clear-cut objectives and problems from the standpoints of Indian industrial growth and the association which has been set up with industry.

Dr Atma Ram, Director General, Scientific & Industrial Research referred in his address (read out) to the monumental work of Prof. Todd and his collaborators leading to the elucidation of the structure of vitamin B₁₂ and the complicated structures of a variety of pigments. Prof. Todd was awarded the much coveted Nobel Prize in 1957 and his laboratory became the 'Mecca' for investigators all the world over in the field of nucleic acid chemistry. He has been a staunch advocate of inter-disciplinary collaborative work in the field of biological sciences. Dr Atma Ram added that CDRI is multidisciplinary in its character and solution to its various scientific problems is sought by unified groups of scientists drawn from different disciplines.

Earlier, Dr M.L. Dhar, Director, CDRI, in his welcome address stated that the new laboratories for medicinal chemistry, biochemistry and

biophysics are equipped with modern tools of research, including ultracentrifuges, counters, gas chromatographs, electron microscope, an NMR spectroscope and a mass spectrometer. The research programmes are project oriented and include the following: antifertility and physiology of reproduction, chemotherapy of filariasis, amoebiasis, viral infections and cancer, drugs action on the central nervous and cardiovascular systems, medicinal plants and antibiotics. The institute is also working on the development of commercial processes for drugs and pharmaceuticals and has an interest in cholera genetics and cytology of the melanocyte.

CDRI and its new divisions: objectives and resume of work

The objectives of the institute include synthesis of new chemotherapeutic agents based on detailed biochemical, biophysical and immunological studies of disease processes; chemical and biological investigations of Indian medicinal plants for developing antibiotics and other remedies; developing new contraceptives and studies on physiology of reproduction; and standardization work relating to know-how for production of basic drugs and their intermediates.

The new laboratories have over 75 scientists out of a total of about 200 on the rolls of the institute. The Medicinal Chemistry Division has a microanalysis and a glass-blowing section, besides facilities for spectroscopy, including nuclear magnetic resonance and gas chromatography. The division has been engaged on chemical studies of over 50 medicinal plants. Some 2500 new compounds have been synthesized and subjected to wide spectrum screening for biological activity. An antithyroid compound has undergone successful clinical trials, while another compound shows promise of controlling IUCD-induced bleeding. Veterinary trials on a cestodicidal agent have given good results. Among other potential drugs which are in the pre-clinical development stage, special mention may be made of a tranquillo-sedative, an antifertility agent, an anti-filarial, a hypoglycaemic compound, an anti-convulsant, a local anaesthetic and an analeptic. Synthesis of biologically active polypeptides is an important field of interest, and bacterial

cell wall peptides, substitutes for lysozyme, analogues of oxytocin and vasopressin, and steroidal polypeptides have been synthesized.

The Biochemistry and Biophysics Divisions are equipped for investigations on enzymes, nucleic acid, lipids and other biopolymers with refrigerated and ultra-centrifuges, cryobaths, lyophilizers, polarograph, ultrasonic generators, Geiger-Muller, scintillation and proportionate gas flow counters. The latest addition to the laboratories is a model II E Hitachi electron microscope with a rated resolution of 4.5 Å. A Hitachi mass spectrometer RMU 6 is being commissioned. The Biochemistry Division is engaged in the study of the enzymology of pathogenic organisms and parasites and biochemistry of phospholipids. The glycolytic pathway of carbohydrate metabolism in filarial parasites and a cestode, parasitic to fowls, have been studied. Enzymic and antigenic profiles of *Entamoeba histolytica* and free-living amoebae have been investiga-

ted in relation to amino acid metabolism and post-infection changes in the host caecum. Biochemistry of excystment and encystment of amoebae is being investigated.

The Biophysics Division has made important contributions in the elucidation of the nature of the cyst wall of amoebae and permeability to different chemical and physical agents. Phase contrast and electron microscopic studies have revealed the sub-cellular changes that follow excystment of free-living amoebae and the presence of the hitherto undetected bodies in the nucleus and cytoplasm of *E. histolytica*.

The laboratories have also undertaken developmental problems referred by the pharmaceutical industry and government agencies in relation to processes for indigenous manufacture of drugs and pharmaceuticals. A unit for the fractionation of plasma proteins and preparation of gamma globulin from human placenta has been set up.

Chemicals and Oil from Coal Symposium Proceedings

For almost a century coal was the source of almost all hydrocarbons and in fact the base rock of the present 'chemical age'. Three basic raw materials—benzene, naphthalene and anthracene—provided a vast array of intermediates for the dyestuffs industry. Coal tar via phenol gave the first thermoplastic resin, polystyrene. The backbone of modern chemical coatings and of vinyl plastics is naphthalene. The spectacular growth in the use of these products derived from the aromatic building blocks during the past 20 years created a demand far beyond production capacities of coal tar chemicals, the conventional source of these aromatics.

The production of coal tar is naturally limited to the amount of coal that is carbonized for iron and steel or gas industries. As the demand outstripped the supply, petroleum slowly came in to fill in the gap, especially during the post-second World War period and thus came up the petro-chemical industries.

While aromatics (benzene and allied products) constitute one of the major group building blocks of chemical industries, especially dyestuffs, pesticides, fungicides, thermo-setting and thermoplastic resins and synthetic rubbers, 'olefins' constitute the other major group for modern synthetic hydrocarbons industry, mainly for long chain polymers, like polyethylene as polypropylene and butyl rubbers.

The combination of these two groups of building blocks can also produce a vast range of man-made fibres, plastics, chemicals, explosives, etc. and thus constitute the where-withals for both peace and war. Fertilizers are another group of heavy chemicals which can be produced either from coal or from petroleum. Ammonia, which is the basis of nitrogenous fertilizers, is produced by steam reforming of carbon which is contained in both these raw materials.

The international symposium on 'Chemicals and Oil from Coal' organized by the Central Fuel Research

Institute (CFRI), Dhanbad from 6 to 8 Dec. 1969 at the institute took note of the growing field of petro- and carbo-chemicals synthesis and especially the role of coal at present and in future.

Inaugurating the symposium Prof. V.K.R.V. Rao, Union Minister of Education & Youth Services and Vice-President, CSIR, said that contrary to traditional concepts of coal as an uneconomic raw material for production of oils it is possible to improve coal conversion technology to make the coal-to-oil project economically viable. He called upon CFRI scientists to make efforts in this regard and also find ways and means of reducing the cost of production of chemicals from coal.

The symposium covered broadly the following aspects: (1) development of carbo-chemicals from coal, coal tar distillates and benzole including refining, recovery and use; (2) direct conversion of coal to oil and chemicals; (3) chemicals and oil by Fischer-Tropsch synthesis and oxo-synthesis; (4) catalysis in carbo-chemical synthesis; (5) production of agricultural chemicals including fertilizers, soil conditioners, pesticides, insecticides, ion exchangers, detergents, etc. from coal; (6) production of coal chemicals by oxidation, hydrogenation, nitration, halogenation, electrochemical reduction, bio-degradation, etc.; (7) new techniques of chemical synthesis; and (8) analytical techniques for evaluation, characterization and identification of coal chemicals.

Of the 60-odd papers presented, nearly half were from CFRI and a substantial number from scientists from USA, Canada, Germany, USSR, Japan and UK.

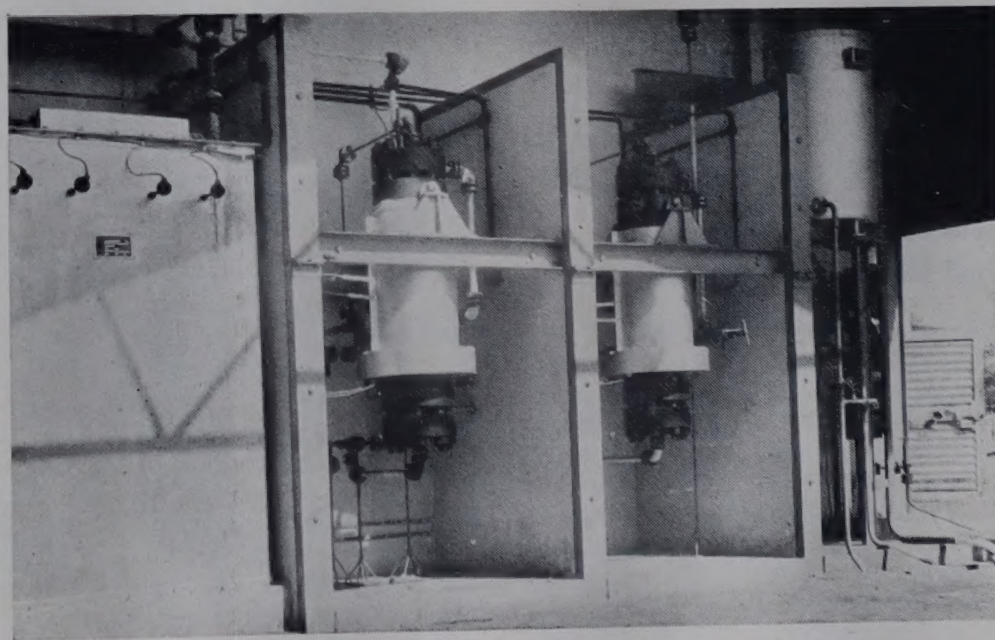
A highlight of the symposium was the 'Preliminary techno-economic feasibility study for the production of oil from coal in an integrated coal-petroleum refinery based on coals and natural crudes of Upper Assam', a paper presented by Dr A. Lahiri, Director, CFRI. In this giant coal-oil chemical complex it is proposed to produce about 3 million tonnes of products, half of which will be derive from the unique high sulphur low ash coals of north Assam and the rest from Nahorkatiya petroleum. The value of products which include benzene, toluene, xylene, naphthalene, phenols, cresols, ethylene, propylene, buta-

diene, ammonium sulphate, elemental sulphur and electrode coke will constitute 60-70% of the value of total products sold and will be the precursors of a major petro-chemical industry based on direct conversion of coal to oil and chemicals. The rest (1.8 million tonnes) will constitute energy fuels, namely high speed diesel oil, superior grade kerosene, high grade jet fuels for military and civil aircraft and about 0.56 million tonnes of naphtha which can be either used as gasoline or utilized for feed-stock for fertilizers.

Researches carried out by CFRI over the years have established that the coals of Upper Assam are perhaps most easily converted to oil, not only in India, but in the world. The large reserves of coal and paucity of oil add special significance to this project. It has been estimated by CFRI that during the next 30 years India will have to import Rs 15 000-20 000 crores worth of petroleum products, crude or finished, even on the basis of current prices, constituting nearly 15-20% of foreign exchange earning capacity in future which may prove to be a serious burden to the nation.

The symposium focused the activities of the institute not only in the conversion of this unique coal to oil but also in production, recovery, refining and conversion of many of the basic chemicals. Of equal interest was the contribution from USA, Canada and Germany

outlying the current developments in major R & D efforts undertaken by the US Government through the Office of Coal Research (OCR) and of the US Bureau of Mines for the development of coal hydrogenation and conversion of coal to oil, chemicals and gas. A paper by Mr George Fumich, Director, OCR outlined the activities of the organization which has activated a large number of US firms in undertaking R & D work on this subject. There is today in USA something akin to the 'Gold Rush' of the past which has been aptly termed as 'Coal Rush'. Nearly 50% of the huge resources of coal in USA and a quarter of producing mines had passed under the control of the major oil or chemical companies who were hopeful of large scale economic conversion of coal to oil in USA to meet the ever-growing need for mobile energy, hydrocarbon chemicals and pipelines gas. Other papers outlined the areas where R & D efforts could be best intensified to make such products economically more viable. It was Dr Lahiri's thesis, however, that under Indian conditions to make conversion of coal to oil economical, an integrated approach was necessary. Since marketing of energy fuels by oil companies was of world-wide cartels, to make coal conversion competitive it will be necessary to produce high cost chemicals as an integrated part of any coal-to-oil venture. A major cost in coal conversion is



Two catalytic reactors (cap. each 250 litres/day) of high pressure catalytic hydrogenation pilot plant installed at CFRI for production of liquid fuels and chemicals

that of hydrogen required for liquefying coal. The various approaches for the production of hydrogen cheaply from coal were also discussed in the symposium. Coinciding with the symposium was the commissioning of the vapour phase high pressure catalytic hydrogenation pilot plant for the production of liquid fuels and chemicals.

The symposium brought to focus the work of Canadian and US scientists on the decarboxylation of coal acids, which is considered as a breakthrough in this field. So also the work of the Fertilizer Corporation of India on the development of active catalysts for studies on gas reforming, purification, etc.

On the basis of a technical note prepared by CFRI it was felt that the problem centred round the development of effective catalysts for liquefaction of coal.

References were made to the work in Japan, Germany, USA and Czechoslovakia regarding fundamental concepts for basic understanding of the reaction mechanisms involved in the conversion of coal to oil and chemicals by hydrogenation, oxidation, halogenation, etc. Further studies on these aspects were considered necessary. Planning had to be done depending on the regional or national economy and resources of the country concerned.

Production of chemicals by the Fischer-Tropsch synthesis technique had potentialities which must not be overlooked. Recovery and utilization of tar oils, benzole, naphthalene and anthracene deserve special attention and CFRI's work in these fields is significant.

Coal Conversion Expert in CFRI

The services of Dr Ing. E. E. Donath, international expert in coal conversion studies, have been secured by the Central Fuel Research Institute, Dhanbad through US Aid for International Development. This assignment involves rendering technical expertise for preparation of (i) techno-economic feasibility study and flow-sheet for conversion of Assam coal to oil and chemicals; (ii) programme of work on coal hydrogenation and hydrogen production; and (iii) de-

sign and cost estimation for a recommended flow-sheet for coal hydrogenation plant, and experimental hydrogen production unit which may be coupled with the former.

Central Mining Research Station

The annual report of the Central Mining Research Station (CMRS), Dhanbad for the year 1968-69 has just been published. The 250-page report describes the progress of research activities projectwise under the following disciplines: Mine technology, Mine safety, Mining engineering, Health, and Air pollution. The highlights of the year's progress are brought out in the first two chapters.

The mine technology group was engaged in strata control survey in which an experiment for working a thick seam without stowing in slices with artificial roofing was tried in India for the first time. The effectiveness of roof bolting as a means of roof support has been studied. It has been found that roof bolting was more effective than the conventional timbering to arrest roof falls. On the recommendation of the station, collieries are using bolts instead of timber as roof supports. Bolting techniques suitable for soft strata have been investigated. For example, two techniques developed on grouting and perforated bolting were simple and economical compared to the existing methods practised elsewhere. The recoverable wedge-type bolt, developed for the splitting operation, offered considerable saving in bolting costs when bolts recovery was essential.

An important project completed by the mine safety group was the trend of dust spraying in coal mines in order to examine the features of stone dusting practices in Indian collieries. The magnitude of free silica content in coals collected from different collieries was also determined keeping in view the existing restrictions on the limit of free silica content of stone dusts. Development of gas detectors was another project which made substantial progress during the year. A tube for detecting hydrogen sulphide was developed. The know-how for the manufacture and quality control of highly sensitive detector tubes for carbon

monoxide was provided to a firm. Devices for monitoring methane, based on viscosity of methane and methane-air mixtures, as well as on catalytic oxidation of the gas, have been developed. Ten units of bench model methanometer were fabricated and supplied to collieries. Investigations were also carried out on the development of chemicals used in self-rescue masks.

The investigations which came under the purview of the mine health group included the problem of dust in a mineral handling plant, study of dust production in mines in relation to seam characteristics, dust hazards in refractory industry; and lung function tests among coal miners.

Investigation and testing of mine wire ropes received the attention of the mine engineering group. Some 223 indigenous and 386 imported wire ropes were tested during the year. The main causes of deterioration were found to be corrosion, external wear and fatigue. Analysis of the data on mechanical tests on ropes revealed a steady fall in all the properties of ropes after 10-12 weeks of installation. Investigations on mine gear components such as safety hooks, chains, shackles, capps, etc. have provided data which will help minimize hoisting accidents, increase the service life of the components and enhance the safety and efficiency of mines.

Testing facilities and technical services provided to the mining industry represented as in the previous years a substantial proportion of the laboratory's efforts. The income from technical services rendered to the industry by way of consultancy, testing and analysis amounted to about Rs 2.90 lakhs during 1968.

Patents in respect of six inventions were accepted during the year. The inventions included remote indicating hydraulic load cells, remote indicating convergence indicators and clamp-type friction props. Patents in regard to the following devices and process were filed: electrical relay tester, cable fault locator, mine ventilation slide rule, and a process for heat treatment of steel wires for rope manufacture. Five research papers were published during the year.

INVENTION AWARD TO SASMIRA

The Silk & Art Silk Mills' Research Association (SASMIRA), Bombay has been awarded a silver shield by the Inventions Promotion Board, New Delhi for developing indigenously a perspirometer. SASMIRA in its programme of developing testing instruments required by the textile industry for quality control purposes designed and fabricated the instrument, an import substitute, which has resulted in saving of foreign exchange. The instrument is being widely used in the textile units of SASMIRA.

The perspirometer (8 in. long, 6 in. wide and $7\frac{3}{4}$ in. high) is intended for rapid determination of colour fastness to perspiration (both alkaline and acid) of dyed and printed textiles. It also meets the need of the quality wool mark scheme of the

International Wool Secretariat. The instrument consists of two plates. The bottom plate has two main bars fixed in vertical position and also two smaller guide bars for positioning the plastic plates. The top plate acts as a cover for the 21 plastic plates and the load on the specimens is given by the action of compensating springs and thumb screws. The load can be adjusted to the desired limit marked on the sleeves.

For operation the coloured specimen is cut into 4 in. \times 4 in. and stitched by sandwiching the specimen between white cotton and woollen fabric. The stitched test piece is soaked in the laboratory-made perspiration liquor for 30 min., care being taken to see that no air bubble is trapped between the white fabric and coloured specimen under test.

After 30 min. cezing taken in a mangle the test piece is placed between two 4 in. \times 4 in. plastic plates and then they are placed one above the other, until all the 21 plates are arranged. The 21-plate arrangement is transferred to the bottom plate of the instrument with the help of two guiding bars. The top plate is placed on top of the plastic plates. The two compensating spring sleeves are then introduced through the main bars. The thumb screws are turned to give 10 lb pressure. The centre loaded instrument is placed in a drying oven at $38^{\circ} \pm 1^{\circ}\text{C}$ with the plastic plates occupying a vertical position for 6 hr. After 6 hr the loaded instrument is removed from the oven, the top plate unscrewed and the test specimen removed to observe the change in colour and staining of the white cotton/wool as per the international geometric grey scale.

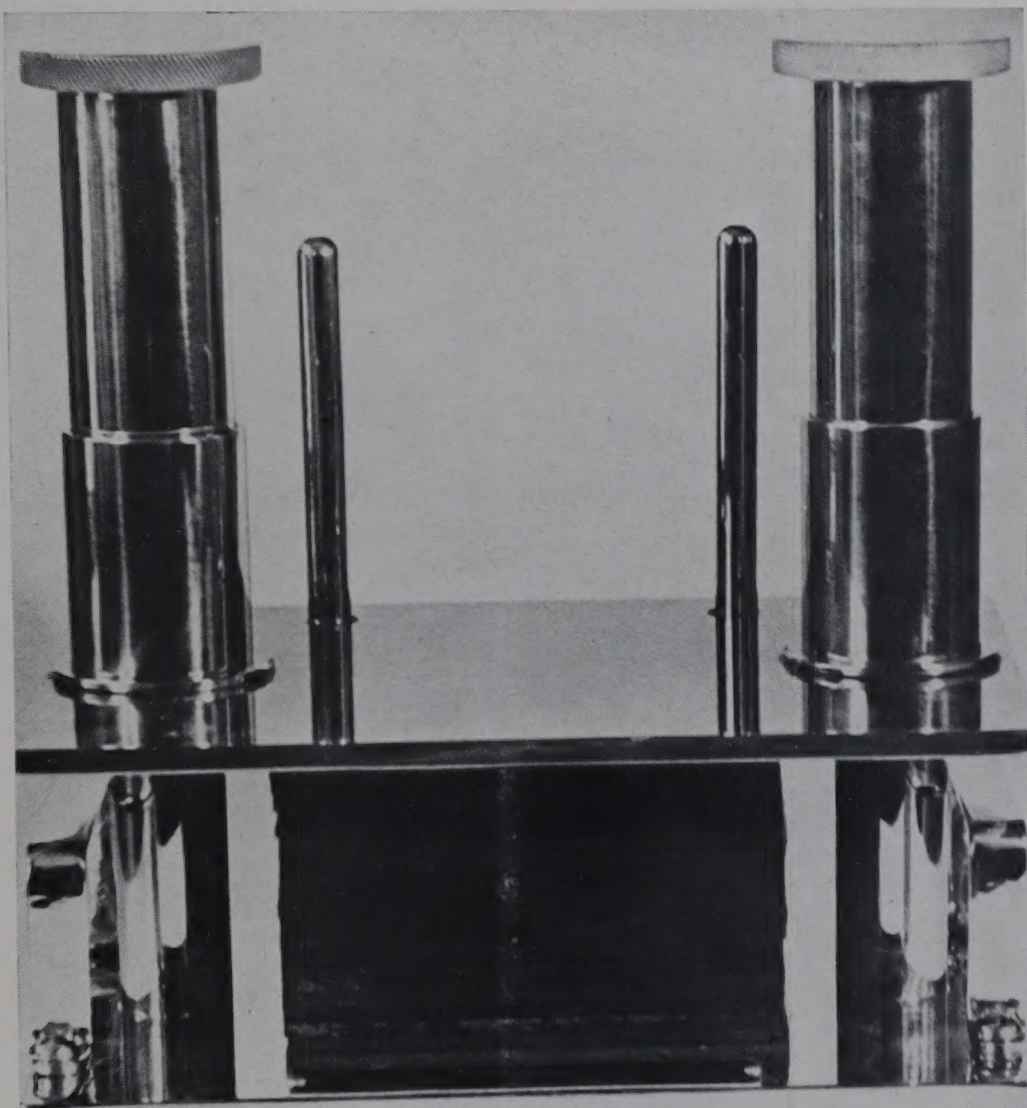
The Director of SASMIRA, Shri J. G. Parikh, received the award from the President, Shri V. V. Giri at a ceremony held at Rashtrapati Bhavan, New Delhi on 17 Dec. 1969.

Deputations

Dr M. Pancholy, Scientist, National Physical Laboratory, New Delhi left on deputation for London on 24 Jan. 1970. Dr Pancholy will spend 4 to 6 weeks in UK studying the current trends and techniques in research, standards and development in the field of acoustics and will visit a number of prominent laboratories in UK including the National Physical Laboratory, Teddington; Building Research Station, Garston; the Institute of Sound & Vibration Research, University of Southampton; Research Department of the BBC, London; Mullard Research Laboratory, Redtull, Surrey and Imperial College, London. He will also be visiting some laboratories in West Germany and Hungary on his way to UK.

Visitors

Dr S. P. Pradhan, Head of Dept of Physics, Tri Chandra College, Kathmandu visited the Central Road Research Institute, New Delhi on 26 Dec. 1969.



Perspirometer — for determination of colour fastness to perspiration of dyed and printed textiles — designed and fabricated at Sasmira

Rev. H. Santapau

We record with deep regret the passing away of Reverend Father Hermenegild Santapau in Bombay on 13 Jan. 1970.

Fr Santapau was born in Spain in 1903. After taking his doctorate degree in botany from the London University he came to Bombay and made India his home since 1928. He became a professor at St Xavier's College, Bombay. He did extensive botanical field work in different areas in India and collected more than a lakh specimens. For his contributions to Indian botany, many newly discovered plants were named after him. He became Director of the Botanical Survey of India in 1961 from which post he retired in June 1968 and returned to St Xavier's College to take charge of his old department.

Father Santapau was currently engaged in studies on the Flora of Bombay, a CSIR research scheme under the Biological Research Committee at the Department of Botany, St Xavier's College, Bombay. The main aspects of the study were: (1) completion of the flora of Saurashtra, (2) the flora of the Dangs Forest, and (3) revision of the 'Flora of the Bombay Presidency' by Th. Cooke.

Fr Santapau's work on some parts of India has become classic and is considered authoritative reference, especially his re-classification of the flora of western India.

Author of about 350 research papers, Fr Santapau was awarded the Birbal Sahni gold medal by the Indian Botanical Society in 1964. He presided over the Botany Section of the Indian Science Congress held at Chandigarh in 1966 and was honoured with 'Padma Shri' a year later.

Fr Santapau was associated with CSIR in several capacities—as chairman, Executive Council, National Botanic Gardens, Lucknow; member, Biological Research Committee and as CSIR retired scientist. His association with the Publications & Information Directorate dates back to the 50s. He was member of the editorial committee of *The Wealth of India*—A Dictionary of Indian Raw Materials and Industrial Products. The directorate drew liberally on his expertise and scholarship in plant nomenclature and in dissemination of scientific information through publications.

The Prime Minister and President, CSIR, Shrimati Indira Gandhi's tribute to Fr Santapau reads: "In Fr Santapau's death we have lost an eminent scholar who has served education and science for more than forty years. His deep love of India urged him to become a citizen of the country. He had great knowledge of and concern for our plant wealth and wrote extensively on it for experts as well as laymen. May his memory long continue to inspire all those interested in our flora".

PATENTS

FILED

123365: Technique of bonding PVC sheets to leather to produce finished leather, P. S. Venkatachalam & J. J. Khanna—CLRI, Madras.

123527: Distillation flask, F. Kiss—NPL, New Delhi.

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123642: A process for the production of matrix board (stereo flong), C. N. Saikia, N. C. Nandi, B. P. Chaliha, S. B. Lodh & M. S. Iyengar—RRL, Jorhat.

123843: An improved process for the preparation of alkyl nitrate esters from glycol ethers (for cognating with first divisional of 120116), P. Desikan & K. K. Bhattacharyya—IIP, Dehra Dun.

123844: An improved process for the preparation of alkyl nitrate esters from alicyclic alcohols (for cognating with the second divisional of 120116), P. Desikan, K. K. Bhattacharyya—IIP, Dehra Dun.

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113745: Cable fault locator, R. N. Tarafdar, P. G. Sarkar, B. Ghara, V. R. Pillai & G. Lakshminarayanan—CMRS, Dhanbad.

113824: Improvements in or relating to the preparation of 3,3-bis

chloromethyl oxacyclobutane polymers, Ajai Prakash, S. K. Patra, M. Krishnan & R. T. Thampy—SRIFIR, Delhi.

SEALED

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106804: Improvements related to the manufacture of carboxy methyl cellulose, D. S. Bendale, M. B. Mahajan & H. P. Khadilkar—NCL, Poona.

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106906: An improved method for removal of iron from ferruginous chrome and manganese ores, R. N. Misra, P. V. Viswanathan & P. P. Bhatnagar—NML, Jamshedpur.

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107058: An improved load cell, K. G. R. Jain & D. D. Sahdev—CBRI, Roorkee.

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107270: Indigenous fluorescent dye-penetrants for surface and sub-surface crack detection, S. G. N. Swamy—CMERI, Durgapur.